

AMENDMENTS TO THE CLAIMS

1. (Currently amended) A filter laminate, comprising in any arrangement a plurality of discrete layers of material, wherein each layer is adjacent at least one other layer, said plurality of discrete layers comprising:

a first membrane layer comprising a first membrane, wherein said first membrane is a microporous or ultraporous ~~asymmetric~~ membrane, said first membrane having a first surface and a second surface, each of said surfaces comprising pores, and a support region between said first surface and said second surface comprising flow channels connecting said pores of said first surface with said pores of said second surface, ~~said first membrane comprising an asymmetric region comprising flow channels that gradually increase or decrease in diameter from a point in said support region to said second surface, said first membrane further comprising an isotropic region in addition to said asymmetric region, such that said support region comprises a thickness between said first surface and said second surface, wherein said thickness comprises said isotropic region between said first surface and a point within said support region, and an asymmetric region between said point and said second surface, wherein said isotropic region comprises flow channels that are substantially constant in diameter from said first surface to said point between said isotropic region and said asymmetric region, and wherein said asymmetric region comprises flow channels that gradually increase or decrease in diameter from said point to said second surface~~ said first membrane comprising an asymmetric region and an isotropic region, wherein said asymmetric region comprises flow channels that gradually increase in diameter from a point in said support region to said second surface, and wherein said isotropic region comprises flow channels that are substantially constant in diameter from said point in said support region to said first surface;

at least a second membrane layer comprising a second porous membrane; and

a bonding layer, wherein said bonding layer comprises a hot melt adhesive heat-bonded to said first membrane layer and to said second membrane layer, and further wherein the filter laminate has a flow rate therethrough such that the filter laminate is configured for separation by filtration.

2. (Canceled)

Appl. No. : 10/603,425
Filed : June 24, 2003

3. (Previously presented)The filter laminate of Claim 1, wherein said second membrane is an asymmetric membrane.

4. (Canceled)

5. (Previously presented)The filter laminate of Claim 1, wherein said pores of said second surface have an average diameter at least about 5 times greater than an average diameter of said pores of said first surface.

6. (Previously presented)The filter laminate of Claim 1, wherein said pores of said second surface have an average diameter at least about 10 times greater than an average diameter of said pores of said first surface.

7. (Previously presented)The filter laminate of Claim 1, wherein said support structure comprises a reticular network of flow channels connecting said pores of said first surface with said pores of said second surface.

8-9. (Canceled)

10. (Original) The filter laminate of Claim 5, wherein said average diameter of said pores of said first surface is from about 0.01 μm to about 10.0 μm .

11. (Original) The filter laminate of Claim 5, wherein said average diameter of said pores of said first surface is less than about 0.01 μm .

12. (Canceled)

13. (Previously presented)The filter laminate of Claim 1, further comprising a third membrane layer.

14. (Previously presented)The filter laminate of Claim 13, further comprising a second bonding layer between the third membrane layer and either the first membrane layer or the second membrane layer, wherein said bonding layer is a hot melt adhesive heat-bonded to said third membrane layer.

15. (Previously presented)The filter laminate of Claim 1, wherein said first membrane comprises a polymer selected from the group consisting of polyvinylidene fluoride, polyarylsulfone, polyethersulfone, polyamides, and cellulosic derivatives.

16. (Original) The filter laminate of Claim 1, further comprising a layer comprising a material.

17. (Previously presented) The filter laminate of Claim 16, wherein said material is selected from the group consisting of polyester, polypropylene, polyolefin, polyethylene, nylon, paper, cellulose, glass fiber, and acrylic.

18. (Original) The filter laminate of Claim 16, wherein said material is selected from the group consisting of nonwoven fibrous material, woven fibrous material, web material, sheet material, calendared material, wet laid material, dry laid material, and extruded material.

19-20. (Canceled)

21. (Currently amended) A filter laminate, comprising:

~~in any arrangement~~ a plurality of discrete layers of material, wherein each layer is adjacent at least one other layer, said plurality of discrete layers comprising:

~~a first membrane layer comprising~~ a first membrane, wherein said first membrane is an asymmetric membrane having a skin surface and an open surface, wherein pores of the open surface are larger than pores of the skin surface, and wherein said asymmetric region comprises flow channels that gradually increase in diameter from said skin surface to said open surface;

~~a second membrane layer comprising~~ a second membrane, wherein said second membrane is an asymmetric membrane having a skin surface and an open surface, wherein pores of the open surface are larger than pores of the skin surface, and wherein said asymmetric region comprises flow channels that gradually increase in diameter from said skin surface to said open surface; and

a bond between each of said adjacent layers, wherein ~~said bond is between~~ the skin surface of the first membrane and is bonded to the skin surface of the second membrane, wherein the filter laminate has a higher bubble point than either the first membrane or the second membrane, and wherein the filter laminate has a greater integrity than a combination wherein the skin surface of the first membrane and the skin surface of the second membrane are adjacent to each other but not bonded to each other, wherein the filter laminate has a flow rate therethrough such that the filter laminate is configured for separation by filtration.

22. (Previously presented)The filter laminate of Claim 1, wherein the bonding layer is formed from a nonwoven fibrous material, a woven fibrous material, or an open extruded material.

23. (Previously presented)The filter laminate of Claim 1, wherein the filter laminate is permeable to water.

24. (Canceled)

25. (Previously presented)The filter laminate of Claim 21, wherein the filter laminate is permeable to water.

26. (Previously presented)The filter laminate of Claim 1, wherein the bonding layer is a web hot melt adhesive.

27. (Previously presented)The filter laminate of Claim 1, wherein the bonding layer comprises bicomponent fibers containing both a low melting component and a high melting component, wherein the low melting component melts and forms a bond at a temperature at which the high melting component, the first membrane layer, and the second membrane layer survive unchanged.

28. (Previously presented)The filter laminate of Claim 21, wherein a bubble point of the filter laminate is greater than a bubble point of the first membrane layer and the second membrane layer in a skin-to-skin configuration without bonding.

29. (Previously presented)The filter laminate of Claim 28, wherein the first membrane layer and the second membrane layer have different skin pore sizes.

30. (Previously presented)The filter laminate of Claim 28, wherein the first membrane layer and the second membrane layer have same skin pore sizes.

31. (Previously presented)The filter laminate of Claim 1, having a tighter mean flow pore size than the first membrane layer and the second membrane layer.

32. (Canceled)

33. (Previously presented)The filter laminate of Claim 21, having a tighter mean flow pore size than the first membrane layer and the second membrane layer.

34. (Previously presented)The filter laminate of Claim 1, wherein said second membrane is an isotropic membrane.

35. (New) The filter laminate of Claim 21, wherein, for at least one of the first membrane and the second membrane, said pores of said open surface have an average diameter at least about 5 times greater than an average diameter of said pores of said skin surface.

36. (New) The filter laminate of Claim 21, wherein, for at least one of the first membrane and the second membrane, said pores of said open surface have an average diameter at least about 10 times greater than an average diameter of said pores of said skin surface.

37. (New) The filter laminate of Claim 35, wherein, for at least one of the first membrane and the second membrane, an average diameter of said pores of said skin surface is from about 0.01 μm to about 10.0 μm .

38. (New) The filter laminate of Claim 35, wherein, for at least one of the first membrane and the second membrane, an average diameter of said pores of said skin surface is less than about 0.01 μm .